

The Effects of The Video Modeling Product GEMIINI© on Verbal Response Production of Individuals with Autism Spectrum Disorders Who are Nonspeaking or Minimally Speaking

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Abstract

The Current study evaluates the effectiveness of the commercial video modeling program GemlInI© [1] for improving expressive spoken language production with individuals who exhibit characteristics of autism spectrum disorder and are considered nonspeaking or minimally speaking. Based upon the principles of Applied Behavior Analysis [2], video modeling was identified as an evidence-based practice in teaching skills to students with disabilities. In this study, the criteria for using a single-case alternating treatment design embedded within an AB experimental design was implemented to evaluate the effect of the video modeling system on the number of responses produced. No appreciable differences were found related to the effectiveness of the GemlInI© self-management system when comparing baseline performance to the intervention performance.

Keywords: Video modeling; Verbal response production; Autism; Teaching strategies; Social skills

Abbreviations: ABA: Applied Behavior Analysis; JASPER: Joint Attention Symbolic Play Engagement, and Regulation; IDEIA: Individuals with Disabilities Educational Improvement Act; IEP: Individualized Education Plan; AAC: Augmentative and Alternative Communication; PECS: Picture Exchange Communication System

Introduction

As recently as 2021, research indicated that ASD affects approximately one in 44 children aged eight years, according to estimates from CDC's Autism and Developmental Disabilities Monitoring Network [3]. Boys are four times as likely to be diagnosed with ASD than girls [3]. The ADDM network reported that 35 percent of children with ASD were classified in the range of intellectual disability, which was identified as an intelligence quotient (IQ score) of less than 70 [3]. Rose et al. [4] estimated that between 25 and 35 percent of individuals with ASD appear nonspeaking or minimally speaking. This lack of expressive verbal communication was exhibited after receiving several years of educational opportunities and interventions. Limited knowledge appeared related to individuals with ASD who displayed

behaviors related to nonspeaking or minimally speaking. This lack of information appeared partly due to the high variability of this population, which was not defined by a single set of defining characteristics or skills and deficits [4]. The DSM-5's diagnostic criteria for ASD required persistent deficits in each of three areas of social communication and interaction, as well as two of four types of restricted, repetitive behaviors in the identification of ASD. Deficits in social communication and interaction included deficits in social-emotional reciprocity, deficits in nonverbal communication behaviors used for social interaction, and deficits in developing, maintaining, and understanding relationships.

Restricted, repetitive patterns of behavior, interest or activities, as manifested by at least two of the following were

present in the identification of ASD: stereotyped or repetitive motor movements, use of speech or speech; insistence on sameness, inflexible adherence to routines, or ritualized patterns of verbal and nonverbal behavior; highly restricted, fixated interests that are abnormal in intensity or focus; an/or hyper- or hypo-reactivity to sensory input or unusual interest in sensory aspects of the environment [5]. These characteristics were observed on a very individualistic basis and were not exhibited in the same way with individuals diagnosed with autism. The manifestation of ASD appeared individualistic in nature, and it is the broad characteristics of this disability across a spectrum of behaviors, intellectual attributes, and communication problems that characterized autism as a spectrum disorder.

Autism intervention studies developed from using global outcomes measures, such as IQ scores, to more comprehensive ranges of measurements, including expressive and receptive language. In some cases, studies attempted to measure the change in skills or behaviors targeted explicitly by the interventions [6,7]. The following research discussed a variety of interventions for individuals with ASD, beginning with Applied Behavioral Analysis (ABA) [8], followed by communication studies addressing specific Augmentative and Alternative Communication (AAC) [9,10] and Picture Exchange Communication System (PECS) (Gordon et al. 2011) [11].

One intervention strategy proven effective at improving skill deficit areas commonly affiliated with ASD is applied behavior analysis (ABA) [2,10,12]. Various interventions reported in the literature on ABA addressed increased spontaneous communication in individuals diagnosed with ASD. Speech often is targeted using several procedures, including discrete-trial training [13], time delay/prompt fading [14-17], milieu language teaching [18], fading and fluency training [19]. Interventions can appear as peer-mediated or adult-mediated. According to research findings, many individuals with ASD may fail to develop speech and language skills [12].

When developed in the laboratory, evidence-based interventions can take more than 15 years to become widely implemented in the community [20]. Increasingly, researchers are developing and testing interventions in school-based settings, with the additional goal of sustaining the intervention beyond the set study period [21]. Two recent studies demonstrated similar outcomes obtained in the community and the lab. Both studies implemented Joint Attention, Symbolic Play, Engagement, and Regulation (JASPER) aimed at improving core impairments in social communication [22,23]. Both studies noted the sustainability of the intervention over a short-term follow-up related to outcomes obtained by the participants. These and other findings by the Interagency Autism Coordinating Committee highlight the effectiveness of teacher-implemented interventions at improving one of the core features of ASD in school settings and paving the way for more school-based intervention research [21-23].

Without spoken language, individuals can quickly find themselves excluded from the day-to-day happenings in society. A student's K-12 education spans over a decade of the student's life and is the foundation for adulthood. During the 2018-2019 school year, 10.5 percent of students who were provided services under IDEA, Part B (those ages 6 through 21) were identified as exhibiting the characteristics of ASD [24]. Estimates are that 25 to 30 percent of individuals with ASD begin school as nonspeaking or minimally speaking [25]. Individuals with ASD who are nonspeaking or minimally speaking are traditionally excluded from research designs due to difficulties in gaining standardized assessment data from this population of individuals. Professional research on individuals with ASD and communication skill deficits often focuses on individuals five years of age and younger [8,26-28].

Authorities estimate that 30% of individuals with ASD appeared nonspeaking or minimally speaking [25,29]. This limited verbal communication occurs after several years of educational opportunities and interventions. Therefore, an important void in the professional literature appeared related to research or authoritative perspectives that included individuals with ASD who exhibited nonspeaking or minimally speaking behaviors [30,31]. This void in the empirical knowledge base appeared partially due to this population's high variability, which was not defined by a single set of defining characteristics or skills and deficits. In part, because of their developmental functioning abilities, individuals with ASD exhibited extreme challenges in providing reliable or valid assessment measures [29].

Even after years of intervention, estimates indicate that more than one-third of individuals diagnosed with ASD will remain nonspeaking or minimally speaking throughout their lifespan [4,29,32]. The failure to develop expressive verbal communication can interfere with development in many areas, including academics, behavior, socialization, independent living, and later employment [33]. The 2017 Interagency Autism Coordinating Committee strategic plan highlighted the need to study individuals with ASD who display minimal verbal abilities, identifying this most severely affected subgroup of ASD as grossly underrepresented in the behavioral intervention literature [21]. Formatively assessing students who possess no way of expressing the knowledge they possess in a verbal or alternative communication format can often appear difficult, if not impossible, given current intervention research approaches [34]. Without spoken language, academic and everyday life can appear complicated, if not impossible, to navigate for an individual with ASD who displayed consistent patterns of nonspeaking or minimally speaking responding.

Within educational research, work with expressive language interventions often ends after the individual turns five [29]. Research in the field of ASD over the past 20 years showed important improvements in functional behaviors, with the vast majority of studies focused primarily on one of two subgroups: young toddlers and preschoolers [8,27-31] or older higher

functioning, verbal children [29-31]. This focus on these two groups of students exhibiting characteristics of ASD appears primarily because of the ease of evaluating these individuals using standard assessment tools [29].

Due to the wide-spanning nature of the skill deficit areas often associated with ASD, a range of interventions is critical [35]. The Interagency Autism Coordinating Committee describes developing interventions for individuals who exhibited responses consistent with individuals considered as minimally speaking as appearing very challenging educationally. According to this committee, digital-based technology interventions for individuals with ASD continued to increase in accessibility, breadth, and depth of use [21]. Another research strategy with empirical backing for teaching individuals with ASD implemented video modeling [36]. Scientific evidence also increased regarding the effectiveness of technology-based or technology-enhanced interventions [21]. According to the committee, technology-based interventions exhibited the most potential to benefit individuals with ASD, including helping them improve their social and communication skills and greater independence. One important benefit of technology-based interventions addresses the possibility of improving the individual's overall quality of life [21,37].

In the past two decades, the technology used for intervention and instruction increased at a breathtaking rate for all students, especially those with ASD [37]. Few individuals in first-world countries were untouched by some form of technology; they wear it on their wrists, carry it in their pockets or purses, go to sleep and wake up to it, and may even depend on it to keep their heart beating at the right pace. An example of this phenomenon was apparent in the quick increase of technology in teaching strategies and interventions used to support individuals with ASD in recent years [37-39].

Rayner et al. [40] research on video-based intervention found the concept an effective option for instructing individuals with disabilities in various socially significant behaviors as an important contribution to the improved functional behaviors of these individuals. Emphasis appeared in the relevant reviews and studies [6,41-50] were related to applications of these procedures for participants diagnosed with ASD. Video-based intervention appeared as a broad term used to encompass procedures involving presenting video footage as the independent variable for intervention in many of these studies. Thus, video-based intervention included approaches such as computer-based video instruction [49,51], video modeling [52,53], video priming [54], interactive video instruction, also known as video prompting [55,56], and video self-modeling [57,58]. Studies report that one of the advantages of video-based intervention appeared as minimizing distractions by requiring students to look at a small area on the computer or device screen. Research highlighted the efficacy of video technology for individuals with strong visual

processing abilities, a strength of many individuals with ASD [40,59].

As the application for mobile devices and the on-demand video market continued to grow with technological advances, the pre-made video modeling market expanded [37]. Google Play™ applications like Autism Help by Class 5320 [60] focus on daily tasks and routines, while ExerciseBuddy® by ExerciseBuddy, LLC [61] provides video modeling of single stretches and exercises. MeMinder by CreateAbility Concepts Inc., iModeling by AutismAssociation of South Australia, and MyPicturesTalk by Grembe Inc., all iTunes® application products, allow for the creation of videos tailored to the individual user.

Commercial programs for social skills instruction included Watch Me Learn®, an on-demand and DVD-based platform of video modeling videos with a social-skills focus, and Model Me Conversation Cues® [62], an application, software, and video platform video modeling instruction, including conversation skills. Additionally, Superheroes Social Skills [63] was a computer-based program with videos for social skill instruction. Speech Blurbs by ©Blub Inc. [60] appeared as a speech and articulation development application that used the device's front camera engaging the learner in speech practice.

Another commercial video modeling intervention incorporating video modeling and word production is GemIIni© Systems [64]. Based out of Spokane, Washington, GemIIni© claims to be appropriate for usage by parents, therapists, and schools worldwide [1]. The GemIIni© program is a video modeling intervention developed by two parents to engage children with autism, teach them word identification, and enhance their speech output. The program, which spans many levels ranging from letter pronunciation to initiating requests, used video clips that were screened discreetly multiple times daily [64].

The GemIIni© videos zoom on the speaker clearly showing how the tongue and the lips moved to articulate any specific letter. Though the intervention was criticized for encouraging parents to let their children with autism spend prolonged periods glued in front of TVs and electronic devices such as tablets, some researchers argued in favor of the novel program that replaced regular speech therapy [64]. Even though the company backed much of the support for the GemIIni© program, there still appeared limited independent research on the effectiveness of this commercial product for improving expressive language [64,65]. The Wisconsin Department of Health Services Treatment Intervention Advisory Committee was an outside opinion supporting the product. The committee found GemIIni© as a well-established or vigorous evidence-based practice with proven and effective treatment [65]. With a standard subscription price of 98.00 dollars a month, the importance of a high-quality product appeared vital for parents and professionals alike [6].

Significance of the Study

Many individuals with ASD are nonspeaking or minimally speaking [29]. More significantly, many individuals with ASD exhibit behavioral responses consisted with children who were nonspeaking or minimally speaking after age five [25,29,67]. Limited research appears in the professional literature on individuals older than five who displayed behavioral patterns consistent with children who were nonspeaking or minimally speaking. Speaking still appeared as the most important of the four foundational language learning skills [68]. Spoken language allowed a person to retrieve and access every word he knows in a specific language. According to Zhang [69], spoken language through speaking produces minimal to no delay in conversation and is always accessible by the individual. Very few products are available for instruction in expressive spoken language production. Though often promoted, GemIni appeared as a product that possessed limited outside research on its effectiveness. The importance of this study related to the evaluation of the effectiveness of an instructional strategy used in teaching a communication skill that potentially possessed social significance and increased independence with students who exhibit characteristics of ASD who also exhibit behaviors consistent with those individuals considered as nonspeaking or minimally speaking.

Purpose of the Study

Based on the research and regulations with IDEIA (Individuals with Disabilities Educational Improvement Act, 2004), ESSA (Every Student Succeeds Act, 2015), and Common Core State Standards [70], a balance must occur between academic standards-based achievement and functional skills achievement for students with cognitive disabilities. Limited research is available for successful strategies for expanding the expressive vocabulary of older students with ASD who displayed characteristic of individual considered as nonspeaking or minimally speaking. This study aimed to determine the effectiveness of the commercial video modeling program GemIni© [1] for increasing expressive spoken language production in individuals who exhibited characteristics of ASD and were considered nonspeaking or minimally speaking.

Method

Participants

Three middle school-age students who received their education in a self-contained special education classroom for students identified with intellectual disabilities participated in this study. All three students were considered eligible individuals based on the Individuals with Disabilities Educational Improvement Act (PL: 108-446). The three participants were eligible for special education services and were on an Individualized Education Plan (IEP) under the categorical disability of intellectual disabilities or autism. All three participants exhibited limited vocal-verbal or gestural communication with a school, home,

or community settings. Within the school setting, all three individuals used an electronic augmentative and alternative communication application on individual iPads®. The images on the program appeared as color-line drawings or photographs. The individuals produced some verbal sounds as a form of expressive communication, but most communication appeared limited to echolalia and delayed echolalia. To protect the identity of the study participants, pseudonyms were used. Jane was the first participant, a 13-year-old female; the second participant was Conn, a 12-year-old male; and the third participant was Tom, a 12-year-old male.

Human subjects and informed consent

The primary researcher and the research advisor completed the CITI Human Subject's Training prior to conducting this research. Documentation of completion of this training appeared on file in the Office of Research at the participating University. Human Subjects approval was obtained from the Office of Research at the participating University, the school district in the research project, and by the school principal at the building where the research was conducted prior to any data collection for this study.

Parental consent

Parental consent was obtained by sending a consent form to the parent(s)/guardian(s). The researcher discussed the nature of the study with the parents over the telephone. Prior to the beginning of data collection and after receiving Human Subjects' approval from the Office of Research at the participating University, signed parental consent occurred. The form was sent home and returned to the researcher, verifying the parents' consent for their son or daughter to participate in this study. The informed consent form included information about the study and contact information of the primary researcher, the researcher's advisor, and the research compliance office at the participating University.

Subject assent

Due to the severity of their disabilities, the students participating in this study were not capable to provide direct assent. After obtaining parental consent, the researcher presented the study to the participant's Individual Education Plan/Special Education team for comment, review, and approval as an alternative to formal participant consent.

Setting

The study was conducted in a classroom for students with moderate to severe intellectual disabilities or autism in a public middle school. The students enrolled in this setting were middle-school-age students working on developing functional skills related to independence in academics, vocational, domestic, recreation and leisure, communication, and social and community living. The age range of subjects was from 12-14 years. These students attended school full-time, seven hours daily, Monday

through Friday, for 36 weeks each calendar year. The public middle school is in a mid-sized Midwestern town. The total enrollment for the district was 14,238 for the year in question. The district reported that 14.1% of its student population were on an Individual Education Plan (IEP).

The self-contained special education classroom exhibited a prescriptive structure as one of its key instructional features. A visual word/picture schedule was displayed on the front dry-erase board to let the students know what activities to expect throughout the day. In conjunction with the large classroom schedule, individual student schedules were provided, in the format most accessible to each student. Each student's personal schedule and work system allowed them to earn individualized reinforcers for completing tasks and/or appropriate skills such as effective communication, ignoring distractions occurring in the classroom, or compliance with instructional directives.

The students worked individually, in pairs of two or three students to one staff, or in a large group setting throughout the day. The classroom structures provided opportunities for students to learn functional academic skills and domestic and pre-vocational tasks. Instruction in these areas occurred throughout the school day through independent work, group lessons, direct instruction, discrete trial training, prompting, repetition, guided to unguided instruction, and other instructional strategies based on applied behavioral analysis. iPads® in the classrooms were used for augmentative and alternative communication, teaching opportunities, and as reinforcers for appropriate work completion, communication skills, ignoring distractions, and compliance with staff directives.

Research sessions throughout this study were conducted in a partitioned-off space in the back of the classroom, separate from the rest of the classroom. The partitioned-off space allowed for minimized distractions for the participants. The work area was cleared of all materials besides the iPad® used in the study, data collection forms, and a writing utensil. A digitized video recording device was present during each research session to document student's performance.

Dependent Measures

The dependent variable was identified as the number of responses produced after the viewing session each day during the respective experimental conditions. Students displayed response production behavior when they repeated the desired response after the researcher prompts. For example, "(participant's name) [pause] says buy [i.e., /baɪ/] (the response)." Ongoing graphic analysis consistent with single-case designs and descriptive statistics were employed for data collection, recording, and subsequent analysis [2].

The researcher completed data collection by viewing digitized video recording, after the conclusion of each of the instructional trial sessions. During the instructional session, the researcher sat

across a table from the participant; the only items present during this session were the researcher's data collection form and writing utensil. The participant was prompted to imitate one response at a time during instruction, in the order listed on the data collection form. The format for this prompting was as follows: "(participant's name) [pause] say buy [i.e., /baɪ/] (the response)." A 5-second response time following the provided verbal prompt allowed the participant time to respond to the instructional prompt. If the participant said the word correctly and independently within 5 seconds, a plus (+) score was recorded next to the corresponding response on the data collection form. If the participant did not respond within 5 seconds or responded incorrectly, a minus score (-) was recorded next to the corresponding response on the data collection form. The procedure was repeated for each of the 20 responses opportunities from the list presented to the participant during an instructional session.

A correct response occurs when the student says the word cued in a manner that was distinguishable to the observer and independent observer from the digitized video recording of each session. The participant did not need to precisely state the correct word if the observer understood the content of the response corresponding to the original stimuli item. An incorrect response was considered as any response that did not resemble the prompted response to a non-familiar listener. An example of a correct response occurred when the participant said /baɪ/ when prompted, "(Student's name) said buy." An example of an incorrect response to the same prompt occurred when the individual said /dʌ/ (e.g., da as in padaka), rather than the prompted word "buy." Verbal praise was provided after each correct response. No verbal praise was provided contingent on an incorrect response by the participant. Each of the 20 responses from the data collection form was presented to the participant in this manner. The term "response" is used rather than a corresponding word, as some responses appeared as more than one word in length, while other responses appeared as only one word. Therefore, the term response provided a more accurate description of the response to the stimulus item presented to the participant.

Participant's data recorded as a frequency measures were related to the 20 items prompted during the instructional session. These instructional procedures were continued over several sessions until steady state responding was established [2,71,72]. After the completion of each instructional session, the data point was recorded in an Excel® spreadsheet under the corresponding participant and date for further data and visual analysis.

Interobserver Reliability

Interobserver reliability of behavior related to definitions for verbal response production was completed using an independent observer to verify the individual responses and to compare their scores to that of the primary researcher. Electronic digitized video recording of the data collection sessions was viewed by the independent observer (speech and language pathologist) in 29%

of the data collection sessions. The independent observer was trained on the data collection procedures before the beginning of data collection in the study. The primary observer trained the independent observer on how to observe and record correct and incorrect responses from the participants. Training consisted of explanation, practice of the data collection procedures, using the same data collection forms and procedures as the primary observer, and understanding the dependent variables. The primary researcher began this training by explaining the definition of the dependent variable and discussing how correct responses look different than incorrect responses. The primary researcher provided questions and feedback throughout the training sessions.

The independent observer drew 19 sessions from 66 randomly selected playing cards representing 29% of the total instructional total sessions, across all three participants. The independent observer then watched the specific electronic digitized video recorded sessions, represented by the randomly shuffled playing cards drawn, and scored each response given by the selected participant during the respective session. The primary researcher and the independent observer utilized the same data collection form for initial observations of the participant's performance that were outlined in the dependent measures section of this study. The data from the initial data collection form was transferred to an inter-observer reliability comparison form for an evaluation of interval-by-interval comparison of the observational agreement between the primary researcher and the independent observer. Data collection of correct responses between the primary observer and the independent observer were compared. The primary researcher's and the independent observer's score were compared on an interval-by-interval basis using a plus or minus score (i.e., + or -) to represent an agreement or disagreement per intervals for each response recorded and subsequently compared. If the independent observer and primary researcher agreed, a plus sign (e.g., +) was noted on inter-observer reliability comparison form to represent an agreement. If the independent observer and the primary researcher were not in agreement, a minus sign was recorded inter-observer reliability comparison form to represent a disagreement for the interval within an entire session. The number of lines of agreement (the positive response agreement) were divided by 20 total responses per session, with the resulting percent appearing as the agreement of interobserver reliability between the primary researcher and the independent observer. Overall, the median interobserver reliability was 100% agreement for session, with an 85- 100% agreement range.

Procedural Integrity

The extent to which the procedural integrity measures of GemIni© video modeling system were implemented with fidelity during baseline and intervention sessions were verified using a procedural integrity checklist. An electronic digitized

video recording of the data collection sessions was viewed by the independent observer (doctoral-level speech-language pathologist) during 17% of the digitized sessions. Each of the 7 procedural checklist items were reviewed and scored using a "yes" for correctly implemented instructional activities in a session and a "no" for incorrectly implemented items on the procedural integrity checklist. The total number of correctly implemented instructional activities were then divided by 7 items on the procedural integrity checklist for each session resulting in a percentage of correctly implemented activities within the instructional session. The implemented activities on the procedural integrity checklist were then calculated as a whole session percentage score to produce the session's procedural integrity score. These individual session scores were then added together and averaged to determine the overall percentage of procedural integrity. Eleven of the 66 sessions were viewed by the independent observer.

The extent to which the procedural integrity measures of GemIni© video modeling system were implemented with fidelity during data collection sessions were verified by comparing the independent observer's scores on the total possible number of instructional activities for each session listed on the procedural integrity checklist. This evaluation of implementation fidelity between the scores of the independent observer and the total number of activities listed on the procedural integrity checklist occurred throughout the baseline and intervention conditions and across all participants in the study. The mean of the procedural fidelity scores was 86%, and the range of scores was 58-100% across all experimental conditions and across all participants.

Cooper et al. [2] recommend that the establishment of a criteria of 80% procedural integrity occurs to assure correct implementation of the experimental procedures as stated for baseline and intervention conditions of the study. When the procedural integrity percentage fell below 80%, review of the electronically digitized recordings occurred with subsequent retraining of the primary researcher on the implementation protocols occurred. According to the primary researcher, the wide initial variability in implementation fidelity scores was due to not allowing the full 5-second response time for the participant and observer not seeing the table where instruction was occurring due to the position of the electronic recording device (i.e., camera) in the first two initial instructional sessions. These problems were quickly remediated to assure a high level of procedural fidelity for the remainder of the instructional sessions. Even with these initial concerns related to the fidelity of implementation of the instructional procedures across baseline and intervention conditions, and across all three participants, resulted in an overall mean procedural integrity score of 86%, with a range between 58-100%, which is above the suggested implementation fidelity criteria recommended by Cooper et al. [2].

Social Validity Measures

At the conclusion of the data collection the staff of the classroom where the research was conducted, completed a survey. Participation in the survey was voluntary and anonymous. The survey consisted of five questions related to the perception of the classroom staff on the use and effectiveness of the GemIni© video modeling system as an intervention. Respondents completed the paper survey to establish perceptions related to social validity. Respondents selected from a 5- point Likert Scale with scoring options as follows: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, or (5) strongly agree.

Results of the survey indicated an agreement in their perceptions that the GemIni© video modeling system was an effective use of time, with an overall satisfaction rating of 4.7 among the three respondents. Scores ranged from three to five, with a median score of five and overall satisfaction score of 4.7. Respondents indicated agreement that GemIni© video modeling system appeared effective in teaching student(s) to produce responses. The classroom teaching staff strongly agreed that implementing the video modeling intervention and data collection procedures appeared feasible by providing a unanimous 5.0 satisfaction rating. The respondents agreed that student(s) appeared to enjoy learning by watching the video clips and giving the responses. Scores ranged from three to five, with a median satisfaction score of 4.0.

Students were not surveyed due to their limitations in vocal-verbal communication skills and limited understanding of the Likert scoring scale due to their intellectual disabilities. The primary researcher observed one of the students enthusiastically repeating the positive praise comments from the video clips and spontaneously announcing "good job" when the clip ended. The researcher cautiously inferred satisfaction with the intervention system from student's comments. The perceptions of classroom teaching staff indicated agreement with the researcher's inference that using video modeling to teach the engagement of responses using the GemIni© self- management intervention appeared enjoyable for students and feasible for the classroom staff.

Experimental Design

The experimental design used in this study uses a single-case alternating treatment design [70]. The initial baseline phase (A) evaluated standard instruction that does not include any video modeling. This study's baseline phase measured the number of responses the subject produces during standard instruction. Baseline data collection took place until steady-state responding was achieved. Data were collected based on repeatability of measurements during instructional sessions using the number of responses to researcher prompts [2].

The initial intervention phase (B) introduced the independent variable, the GemIni© video modeling program, to the participants. The participants watched the video, "Vocal

Imitation Stage 3 Part 2, Vocal Imitation Stage 3 Part 3, and Vocal Imitation Stage 3 Part 4," created by GemIni©, as a commercially available video modeling therapy approach implemented during instructional sessions. These videos were selected as the series focused on early communication skills, imitation, vocal imitation, words utterances, and combinations of these skills. The videos were watched on a tablet or computer in the participants' classroom.

Procedures

Participants in this study received their educational services within a self-contained classroom for students enrolled in special education. The staff for the classroom consisted of a certified teacher in special education and two trained and experienced paraprofessionals. The self- contained classroom for students in special education was set up with a prescriptive structure as one of the key instructional features. In conjunction with the large classroom schedule, each of the participants possessed access to their student schedule customized to their individual routines and learning needs. The structure of the classrooms allowed for limited disruptions and distractions for the students. The classroom structure provided opportunities for students to learn functional academic tasks and domestic and vocational skills. Throughout the school day, the students received instruction on these skills through independent work, group lessons, direct instruction, discrete trial training, prompting, repetition, guided-to-unguided instruction, and other instructional strategies based on principles of applied behavior analysis.

Baseline Procedures. The data collection sessions were recorded via electronic digitized video recordings and occurred when the researcher sat across the table from the participant. During Baseline instruction, the researcher provided only a verbal prompt related to a specific stimulus (e.g., participant's name). The researcher's prompt intended to evoke an imitative verbal response from the participant. The participant received a prompt to imitate one response at a time, in the order listed on the data collection form.

Intervention Procedures. The video modeling program used in this study was produced by GemIni© curriculum organization. The video modeling program combined several evidence-based tactics presenting expressive vocabulary words (e.g., saying the word "crab"). The video modeling curriculum presented each stimuli item from its library in a predetermined, controlled sequence, including repetition of the items by a peer model. Different examples of the label were presented to the participant through a series of pictures and videos on an iPad® as a means of intentionally reducing extraneous sensory distractions during the instructional session. No music or sound effects were introduced or used during the video modeling intervention.

More specifically, five parts to the video modeling filming sequence appeared during the intervention sessions. All the

video modeling sequences appeared on a white background removing all possible distractions and presented only the salient information for the lesson. The first portion of the sequence presented the stimulus response in a single slide, like a flash card, next to a quick video clip of a peer model articulating the specific stimuli item taught. The peer model was shown from the waist up putting the focus peer model's mouth. The visual images were presented on a white background with the stimulus for the response focused on during the stimulus prompt on the screen. Second, a close-up image of the speaker's mouth appeared, which was close enough that articulation or exaggeration of the specific label, such as "c" ... "r" ... "a" ... "b," appeared readily apparent to the participant. Third, a generalized example of the response, which presents photos and videos of many types, sizes, and colors of the object, appeared to help evoke the participant's correct response. Fourth, the close-up of the mouth of the speaker from the video modeling slowly hyper-articulating the stimulus response from the participant. Finally, the first presentation of the stimulus response was repeated from the peer model saying the response next to a picture of the response [64].

The data collection sessions were recorded via electronic digitized video recordings and occurred throughout the baseline and intervention instructional sessions. The researcher provides only a verbal prompt related to a specific stimulus (i.e., the subject's name) during the intervention sessions. The researcher's prompt was intended to evoke an imitative verbal response from the participant. The subject was prompted to imitate one response at a time, like baseline, during the intervention instructional sessions, to decrease the impact of extraneous variables on the data collection.

Results

Table 1 summarized the overall and participant medians and ranges during the implementation of the baseline and intervention conditions. The baseline Videos 1-3 scores ranged 0-20 correct expressive responses given during instruction. Participants median score for baseline Video 1 was 12 correct expressive responses, for baseline Video 2 the median score was 17 correct expressive responses, and for baseline Video 3 the median score was 12 correct expressive responses. The median score for all three baseline videos was 13 correct expressive responses to the prompt given by the primary researcher (Table 1).

For all participants during the intervention (GemIIni© - video modeling instruction), for Videos 1-3 scores ranged 0-20 correct expressive responses to the prompt given by the primary researcher. As shown in Table 1, the median score for Video 1 was 9.5 correct expressive responses, for Video 2 the score was 19 correct responses, and for Video 3 the score was 20 correct responses during the intervention (GemIIni© - video modeling) sessions. The median score for all three intervention (GemIIni© - video modeling instruction) videos was 19 correct

expressive responses to the prompt given during the intervention instructional sessions.

The percentage of words mastered was shown in Table 2. Combined, all participants during the intervention (GemIIni© - video modeling instruction) mastered 65% of the words in Video 1, 67% in Video 2, and 67% in Video 3 during the intervention sessions. On average, the participants averaged 66% of the thirty words presented correctly. Overall, the participants grew 12% in their mastery of Video 1 words identified correctly, 7% on Video 2 identified correctly, and 14% on Video 3 identified correctly; for an average of 11% growth in words identified correctly related to the instructional prompts provided during the intervention instruction.

Jane's median and range of correct responding. Figure 1 displayed Jane's number of correct responses related to each of the three videos during the baseline and GemIIni© video modeling intervention procedures. During the baseline procedure, Jane exhibited a median response score of 19.5 correct expressive responses, and a range of 15-20 responses during Video 1. During Video 2, Jane displayed a median score of 19 correct expressive responses, and a range of 17-20 correct responses to the prompt given by the researcher. Jane scored a median of 19.5 correct expressive responses, and a range of 19-20 responses on Video 3. Overall, Jane displayed a median score of 19 correct expressive responses, and a range of 15-20 correct responses to the prompt provided during the baseline.

During the intervention procedure, Jane exhibited a median correct expressive response score of 19 during Video 1, a median correct response score of 20 and a during Video 2, and a median correct response score of 20 and a during Video 3 during the intervention condition. Jane mastered 98% of the 60 words presented. Table 1 displays a complete summary of Jane's median and range of scores across the study. Table 2 displays a complete summary of Jane's percentage of words mastered throughout the study (Figure 1).

Conn's median and range of correct responding. Figure 2 displayed Conn's number of correct expressive responses related to each of the three videos during the baseline and GemIIni© video modeling intervention. During the baseline procedure, Conn exhibited a median score of 12 correct expressive responses, and a range of 9-18 correct expressive responses during Video 1, median score of 17 correct responses to the prompt on Video 2, and a median score of 12 correct responses on Video 3 during the baseline. During the intervention procedure, Conn exhibited a median score of 20 correct expressive responses during all three videos individually and during the whole intervention procedure. Conn mastered 100% of the 60 words presented. Table 1 displayed a complete summary of Conn's median and range of scores across the study. Table 2 displayed a complete summary of Conn's percentage of words mastered (Figure 2).

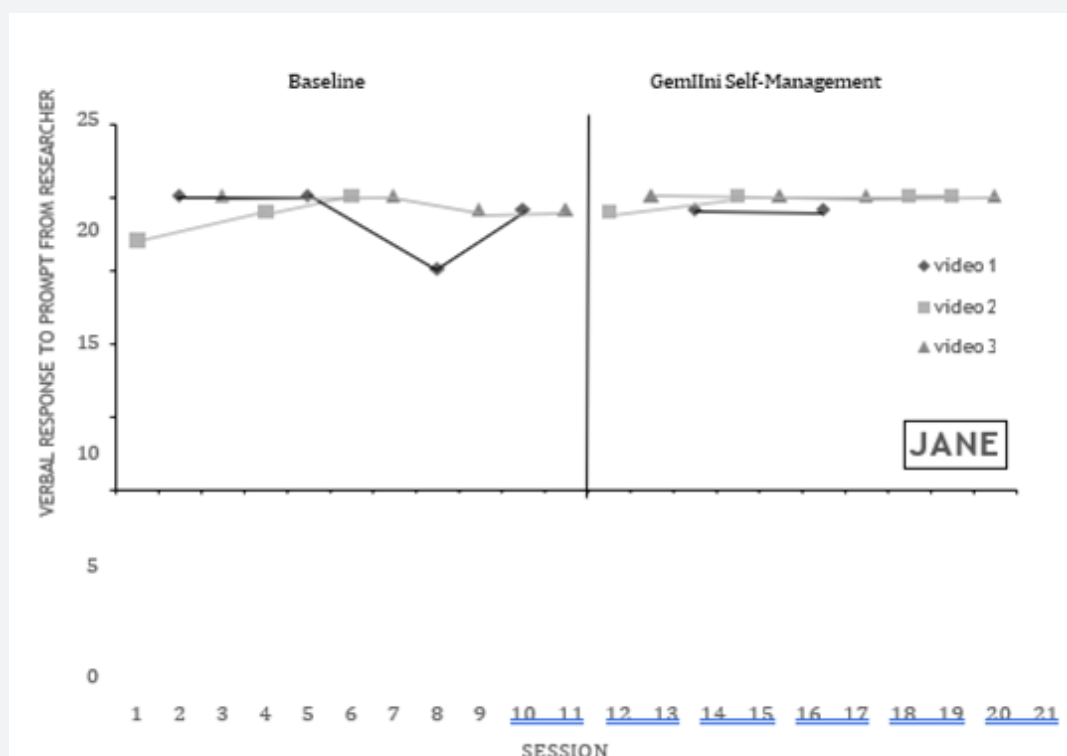


Figure 1: Jane - The effectiveness of three different video models.

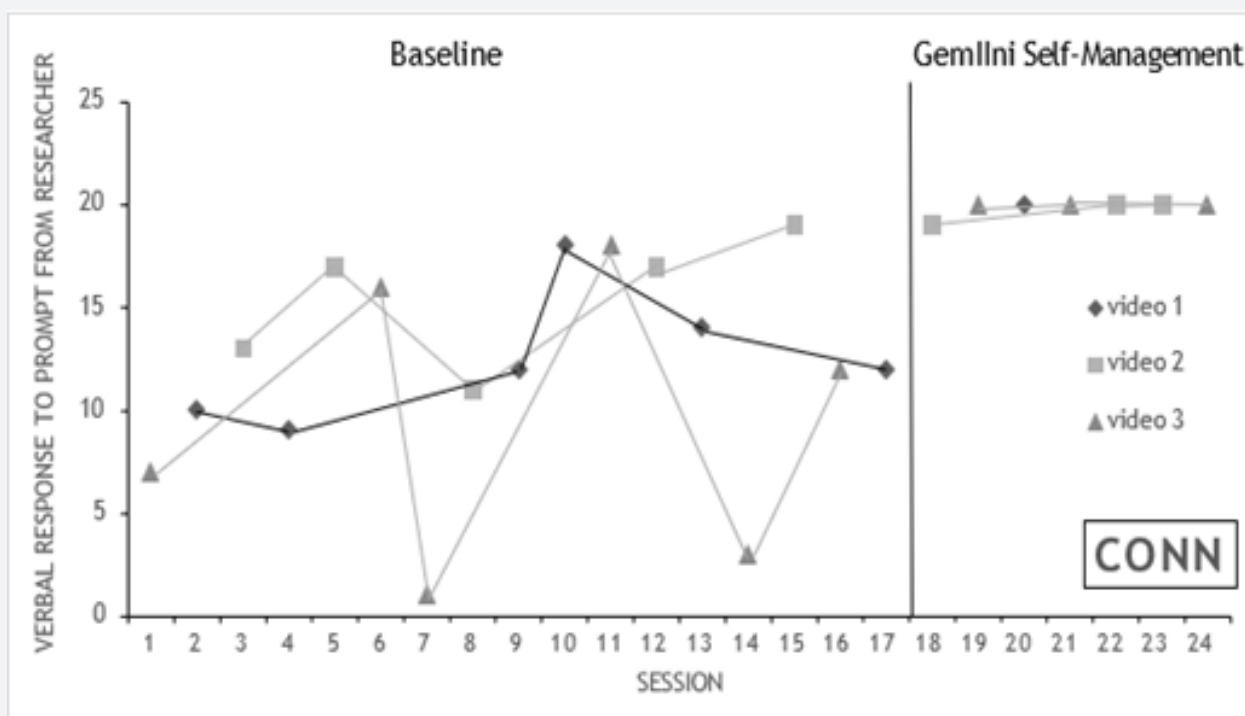


Figure 2: Conn - The effectiveness of three different video models.

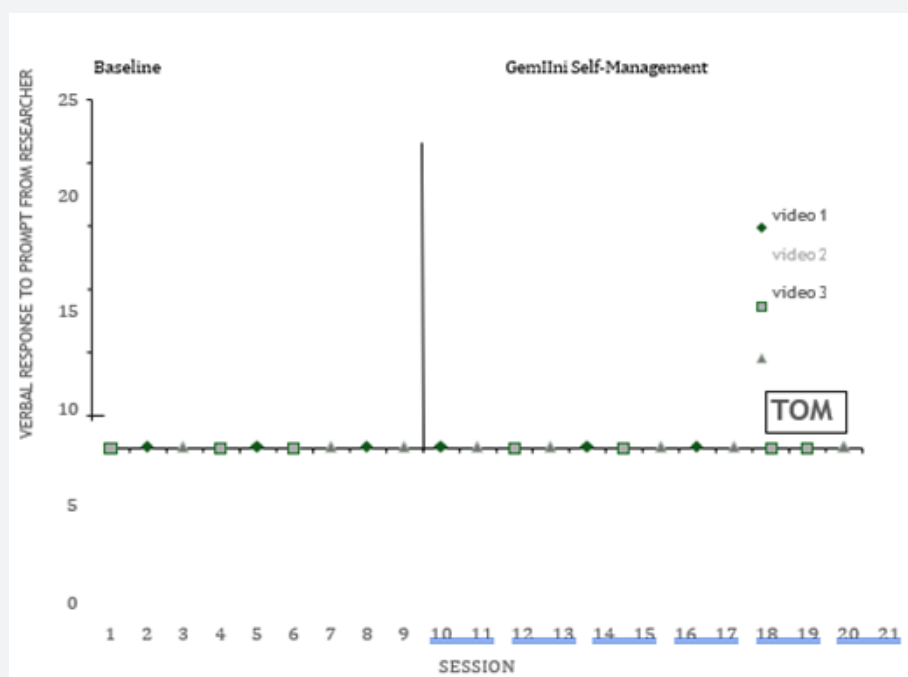


Figure 3: Tom - The effectiveness of three different video models.

Tom's median and range of correct responses. Figure 3 displayed Tom's number of correct responses related to each of the three videos during the baseline and Gemini video modeling intervention procedures during the study. During the baseline procedure, Tom exhibited a median response score of 0 correct expressive responses to the prompt given during all three videos individually and during the entire baseline procedure. Tom also exhibited a median response score of 0 correct expressive responses to the prompt given during all three videos individually and during the whole intervention procedure. Tom identified 0% of the 60 words presented. Table 1 displayed a complete summary of Tom's median and range of scores across the study. Table 2 displayed a complete summary of Tom's percentage of words mastered (Figure 3).

Data from Figure 1 - 3 showed a great deal of overlap in data when comparing Videos 1-3, in both baseline and intervention conditions. Unfortunately, these overlapping data paths, both between and inside of the experimental conditions (i.e., baseline and the Gemini video modeling intervention procedures) do not differentiate any appreciable change in the overall patterns of performance that would suggest an important change due to the implementation of the Gemini video modeling intervention procedures. Without more definitive differentiation of the data paths related to the video modeling approaches, there was no way of determining the relative effectiveness of the intervention procedure or to establish the existence of a functional relationship related to the implementation of the intervention. The overlapping data was possibly due to uncontrolled variables related to the

participants prior history of reinforcement, the interaction with the individual characteristics of their disability (e.g., intellectual disabilities and characteristics of autism), or uncontrolled variables related to the goals of the instruction or factors related to the instructional setting. Therefore, the findings only suggest that caution as well as ongoing data collection and monitoring need to occur if a teacher or practitioner would want to implement and adopt similar video modeling approaches in the future.

Discussion

The current study evaluates the effectiveness of the commercial video modeling program Gemini [1] for improving expressive spoken language production with individuals who exhibit characteristics of moderate to severe intellectual disabilities as well as autism spectrum disorder and were considered nonspeaking or minimally speaking. No appreciable differences were found related to the effectiveness of the Gemini self-management system when comparing baseline performance to the intervention performance or within the intervention were observed. Results of this study supported the following conclusions: (1) the video modeling product Gemini exhibited mixed results related to the number of responses exhibited by students who are nonspeaking or minimally speaking, (2) the measurement procedures definitions were a reliable measurement procedure, (3) evaluation of the implementation of the intervention procedures ensured high fidelity of procedural integrity related to the implementation of the intervention procedures, and (4) the use of video modeling instruction demonstrated high consumer satisfaction amongst special education classroom staff.

The results of this study indicated that the GemlInI© video modeling system was not appreciably effective at increasing the number of verbal responses produced by two of the three students who were nonspeaking or minimally speaking (See Figure 1-3). Due to a great amount of overlap in the data paths evaluating the different video modeling vignettes, and the lack of differentiation between the baseline and intervention instructional conditions, the results (see Table 1 & 2) cautiously indicated some improved performance by 2 out of the 3 participants. The data was analyzed using a single-subject alternating treatments research design, and the results suggested this type of intervention were only marginally successful for the selected participants of this study.

Even so, the perception of classroom staff indicated high levels of agreement related to the efficacy of the use of video modeling as an intervention for the delivery of verbal response production and as an effective instructional tool for improving verbal response production as well as words understood by individuals with severe intellectual disabilities or displaying characteristic of communication deficits consistent with autism spectrum disorders. The instructional staff also stated that they believed that a video modeling intervention of this nature was feasible to implement, enjoyable for the students, important to functional skill instruction, and an overall positive classroom instructional approach.

Table 1: Median and Range of Skill Performance Data during Baseline and Intervention Procedures.

Student	Mdn/Range	*BV1	*BV2	*BV3	*BVs	**IV1	**IV2	**IV3	**IVs
Jane	Median	19.5	19	19.5	19	19	20	20	20
	Range	15-20	17-20	19-20	15-20	19	19-20	20	19-20
Conn	Median	12	17	9.5	12	20	20	20	20
	Range	9-18	11-19	1-16	1-19	20	20	20	20
Tom	Median	0	0	0	0	0	0	0	0
	Range	0	0	0	0	0	0	0	0
Overall	Median	12	17	12	13	9.5	19	20	19
	Range	0-20	0-20	0-20	0-20	0-20	0-20	0-20	0-20

Baseline video 1-3 i.e., BV1, BV2, and BV3.

*All Baseline videos, i.e., BVs.

**Intervention (GemlInI© Self-Management) videos 1-3 i.e., IV1, IV2, and IV3 All Intervention videos i.e., IVs.

Table 2: Percent of Words Mastered during Baseline and Intervention Procedures.

Student	Percent Mastered	*BV1	*BV2	*BV3	*BVs	**IV1	**IV2	**IV3	**IVs
Jane	% Mastered	98	95	98	97	95	100	100	98
	% Grown						-3	5	2
Conn	% Mastered	60	85	60	68	100	100	100	100
	% Grown						40	15	40
Tom	% Mastered		0	0	0	0	0	0	0
	% Grown						0	0	0
Overall	% Mastered	53	60	53	55	65	67	67	66
	% Grown						12	7	14

Baseline video 1-3 i.e., BV1, BV2, and BV3.

*All Baseline videos, i.e., BVs.

**Intervention (GemlInI© Self-Management) videos 1-3 i.e., IV1, IV2, and IV3 All Intervention videos i.e., IVs.

The current study exhibits both similarities and differences from previous research and expands upon the literature base regarding the use of video modeling as an intervention to teach verbal responses to students with severe intellectual disabilities or displaying characteristic of communication deficits consistent

with ASD who were nonspeaking or minimally speaking. Video modeling was used to improve a range of skills in individuals with ASD, including social, communication, adaptive, and play skills [73]. Studies of video modeling's effectiveness with individuals with ASD spanned a broad range of ages (i.e., 3-20 years) and

settings (i.e., school, clinic, community, and home), with some studies combining video modeling with other strategies such as instructional prompts or tangible reinforcers [42,73]. The research by MacDonald et al. [74] supported the claims of gains on specifically targeted skill acquisition using video modeling. Bellini & Akullian [42] conducted a meta-analysis of video modeling interventions for individuals with ASD and found that video modeling interventions met criteria as an evidence-based practice [42,47]. Unfortunately, the results of the current study were not consistent with the previous research literature.

Fortunately, the current study's high interobserver agreement levels and acceptable procedural integrity results were consistent with previous supporting the behavior definitions and measurement systems used to evaluate potential improvements for verbal response production, thus, producing a reliable measurement procedure [64,75]. Gilmour [64] found the use of preselected expressive word targets, with a specific evaluation criterion, as an effective way to improve expressive language.

Additionally, the study appeared as one of the only studies done on this commercially available self-management system outside of the researchers who published and marketed the system. Researchers who publish and market a commercially available system possess an internal bias related to their research because they want individuals or school districts to buy into their system. This internal bias could very well skew the results, intentionally or unintentionally, as a means of marketing their system to the public. Therefore, internal research may appear as a good start to the evaluation process; however, the effectiveness of commercially available interventions needs external validation to assure the objectivity and fidelity of the research as well as increasing the relationship between the intervention system and the participants' behavior in question. Internal research by commercially available curriculum or instructional approaches may lack credibility due to conflicts of interest related to potential internal biases of the researcher due to market pressures and the desire to profit from their intervention system. This cautionary point is especially important if as a profession there is an expectation of practitioners to adopt and use evidence-based intervention approaches with students with disabilities that are based on sound, objective, and unbiased research methodology and analysis.

Another important consideration of this research study is related to this specific population of students with disabilities. This overarching population of students, i.e., those with severe or multiple disabilities, is often seen as "invisible" to the public. Part of the reason for the limited amount of research on this population relates to the low percentage of individuals with severe disabilities in public schools, as well as the lack of inclusive yet functional educational programs for these students in general education settings [76]. Daily practice concerns only exacerbate the problem, leading to the apparent "invisibility" of these students within the general population, as well as in the research

base and professional literature. Minimal attention appeared in the literature related to students with ASD who were above five years of age [77]. Many individuals who acquired spoken language did so between 5 and 7 years of age. These individuals often received behavioral interventions targeting the production of sounds and words and learned to produce single words to request needs and wants. Only one-third of those who began to use spoken language progressed to expressive spoken speech at the phrase length level [78]. Many high-quality and adequate-quality studies predominantly focused on the population who were five years of age or younger.

Since research focused on toddlers with ASD or higher functioning individuals with ASD; however, relatively little is known about language abilities and communication in children with ASD and intellectual disabilities [30,31]. The body of research focused on students who exhibited ASD and nonspeaking or minimally speaking did not appear well represented in the research literature. Minimally speaking individuals who displayed characteristics of ASD, especially as adolescents and young adults, were often assumed as profoundly intellectually impaired and excluded from analyses due to challenges completing standardized testing protocols [79]. Studies provided evidence that children with ASD who appeared minimally verbal can make gains in spoken language through targeted interventions [80].

Relatively few studies were conducted evaluating the effectiveness of discrete video modeling delivered to teach expressive word production, especially with adolescents and young adults [64]. The current study expands the limited field of research for adolescents and young adult students who display the characteristics of ASD and appeared as nonspeaking or minimally speaking, with the use of applied behavioral analysis instruction delivered through video modeling to teach verbal response production skills.

Recommendations for Future Research & Practice

Due to the limited research conducted with adolescents and young adults with severe intellectual disabilities with characteristics consistent with ASD who appeared as nonspeaking or minimally speaking, future research appears needed to determine the efficacy of teaching strategies delivered in formats different than the traditional classroom mode of instruction. Although the current research study failed to produce results that definitively suggest adoption or implementation with students exhibiting behaviors consistent with this population of students, the findings of this research do enhance the recommendation related to the importance of using an ongoing data monitoring system that can formatively evaluate the potential effectiveness of interventions, such as a video modeling system, to assure an objective means of determining the effectiveness or appropriateness of an instructional intervention with a given student. This ongoing monitoring of participant's communication skills also provides a means of differential evaluation of an

instructional intervention. In short, this differential evaluation of an instructional approach suggests that the effectiveness of a specific intervention, such as video modeling, may produce differential impacts on individual participants, meaning an intervention may appear more successful for one individual while producing less improvements on other participant's performance. Therefore, this study does not suggest that the GemIIni© video modeling system was not effective for improving expressive spoken language production with individuals who exhibit characteristics of moderate to severe intellectual disabilities as well as autism spectrum disorder and were considered nonspeaking or minimally speaking in the current instructional setting. In fact, this conclusion underscores the importance of ongoing monitoring of the effectiveness of instructional interventions to find the "best fit" between instructional approaches and addressing the individual behavioral needs of each participant. Future research may allow for the opportunity for further evaluation of the impact of GemIIni© video modeling system with students using discrimination training both individually and in group settings.

This study focused solely on the effectiveness of the commercial video modeling system GemIIni© to increase the number of verbal responses exhibited by students who were nonspeaking or minimally speaking. Future research warrants examination of the following factors: (1) generalization of verbal response skills developed through video modeling instruction; (2) efficiency of video modeling instruction to increase verbal response skill production in comparison to traditional in-person delivery of skill instruction; and (3) investigation into how GemIIni© video modeling system was considered as acceptable across disciplines. Future research also needs to examine the long-term effects of using video modeling instruction. Specifically, how long the gains were maintained and if gains transferred to new environments, classrooms, or teachers after acquiring skills through video modeling instruction.

Conclusion

Even though there a great deal of overlap and variability in the data appeared in the research, the results suggested minimal improvements in performance by 2 out of the 3 participants. In contrast to the overall effectiveness of the overall effectiveness of the commercial video modeling system GemIIni© to increase the number of verbal responses exhibited by students who were nonspeaking or minimally speaking, the perception of classroom staff indicated agreement that the use of video modeling as an intervention in the delivery of verbal response production was an effective instructional tool, feasible to implement, enjoyable for the students, important to functional skill instruction, and an overall positive classroom instructional approach. Given that the perception of the classroom staff is an important consideration in the implementation and adoption of any instructional approach or curriculum, the current study did validate the consumer satisfaction of GemIIni© in teaching verbal response production

skills to students with autism spectrum disorder who were nonspeaking or minimally speaking and in the correct language development stage. Finally, future research appears needed to determine the efficacy of teaching strategies, including strategies such as the commercial video modeling product GemIIni©, for teaching and improving a variety of important functional skills and behaviors, delivered in formats different than the traditional classroom mode of instruction, especially within the population of students on the autism spectrum disorder who appeared as nonspeaking or minimally speaking.

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References

1. GemIIni© Educational Systems (2012) Solutions - get started [webpage].
2. Cooper JO, Heron TE, Heward WL (2020) Applied behavior analysis. (3rd edn.). Pearson Publishing.
3. Autism and Developmental Disabilities Monitoring Network (2021) Prevalence and characteristics of autism spectrum disorder among children aged 8 years. Centers for Disease Control and Prevention. MMWR 70(11): 1-16.
4. Rose V, Trembath D, Keen D, Paynter J (2016) The proportion of minimally verbal children with autism spectrum disorder in a community-based early intervention programme. J Intellect Disabil Res 60(5): 464-477.
5. American Psychiatric Association (2013) Diagnostic and statically manual of mental disorders, text revision: DSM-V-TR (5th edn). Washington.
6. Dawson G, Osterling J (1997) Early intervention in autism: Effectiveness and common elements of current approaches. In: M Guralnik (Ed.), The effectiveness of early intervention: Second generation research. Baltimore, MD: Brookes Publishing, pp. 307-326.
7. Howlin P, Magiati I, Charman T (2009) Systematic review of early intensive behavioral interventions for children with autism. Am J Intellect Dev Disabil 114(1): 23-41.
8. Goods K, Ishijima E, Chang YC, Kasari C (2013) Preschool based JASPER intervention in minimally verbal children with autism: Pilot RCT. J Autism Develop Disord 43(5): 1050-1056.
9. van der Meer LAJ, Rispoli M (2010) Communication interventions involving speech-generating devices for children with autism: A review of the literature. Dev Neurorehabil 13(4): 294-306.
10. Virués-Ortega J (2010) Applied behavior analytic intervention for autism in early childhood: Meta-analysis, meta-regression and dose-response meta-analysis of multiple outcomes. Clinical Psychology Review 30(4): 387-399.
11. Howlin P, Gordon RK, Pasco G, Wade A, Charman T (2007) The effectiveness of Picture Exchange Communication System (PECS) training for teachers of children with autism: A pragmatic, group randomized controlled trial. J Child Psychol Psychiatr 48(5): 473-481.

12. Duffy C, Healy O (2011) Spontaneous communication in autism spectrum disorder: A review of topographies and interventions. *Res Autism Spectrum Disord* 5(3): 977-983.
13. Goldstein H (2002) Communication intervention for children with autism: A review of treatment efficacy. *J Autism Develop Disord* 32(5): 373-396.
14. Charlop MH, Schreibman L, Thibodeau MG (1985) Increasing spontaneous verbal responding in autistic children using a time delay procedure. *J Appl Behav Anal* 18(2): 155-166.
15. Charlop MH, Walsh M (1986) Increasing autistic children's spontaneous verbalizations of affection through time delay and modeling procedures. *J Appl Behav Anal* 19(3): 307-314.
16. Matson JL, Sevin JA, Fridley D, Love SR (1990) Increasing spontaneous language in three autistic children. *J Appl Behav Anal* 23(2): 227-233.
17. Ross DE, Greer RD (2003) Generalized imitation and the mand: Inducing first instances of speech in young children with autism. *Res Dev Disabilities* 24: 58-74.
18. Mancil GR, Conroy MA, Hayden TF (2009) Effects of a modified milieu therapy intervention on the social communicative behaviors of young children with autism spectrum disorders. *J Autism Dev Disord* 39(1): 149-163.
19. Krantz PJ, McClannahan LE (1993) Teaching children with autism to initiate to peers: Effects of a script-fading procedure. *J Appl Behav Anal* 26(1): 121.
20. Morris ZS, Wooding S, Grant J (2011) The answer is 17 years, what is the question: understanding time lags in translational research. *J Royal Soc Med* 104(12): 510-520.
21. Interagency Autism Coordinating Committee (2017) IACC summary of advances in autism spectrum disorder research. U.S. Department of Health and Human Services.
22. Chang YC, Shire SY, Shih W, Gelfand C, Kasari C (2016) Preschool deployment of evidence-based social communication intervention: JASPER in the classroom. *J Autism Dev Disord* 46(6): 2211-2223.
23. Shire SY, Chang YC, Shih W, Bracaglia S, Kodjoe M, et al. (2017) Hybrid implementation model of community-partnered early intervention for toddlers with autism: a randomized trial. *J Child Psychol Psychiatr* 58(5): 612-622.
24. Office of Special Education Programs, Individuals with Disabilities Education Act (IDEA) database, Digest of Education Statistics 2020, U.S. Department of Education.
25. Anderson DK, Lord C, Risi S, DiLavore PS, Shulman C, et al. (2007) Patterns of growth in verbal abilities among children with autism spectrum disorder. *J Consult Clin Psychol* 75(4): 594-604.
26. Rogers SJ, Hayden D, Hepburn S, Charlifue-Smith R, Hall T, et al. (2006) Teaching Young Nonverbal Children with Autism Useful Speech: A Pilot Study of the Denver Model and PROMPT Interventions. *J Autism Dev Disord* 36(8): 1007-1024.
27. Rogers SJ, Estes A, Lord C, Vismara L, Winter J, et al. (2012) Effects of a brief early start Denver model (ESDM)-Based parent intervention on toddlers at risk for autism spectrum disorders: A randomized controlled trial. *J Am Acad Child Adolesc Psychiatr* 51(10): 1052-1065.
28. Vismara LA, Colombi C, Rogers SJ (2009) Can one hour per week of therapy lead to lasting changes in young children with autism? *Autism* 13(1): 93-115.
29. Tager-Flusberg H, Kasari C (2013) Minimally verbal school-aged children with autism spectrum disorder: The neglected end of the spectrum. *Autism Res* 6(6): 468-478.
30. Boucher J, Bigham S, Mayes A, Muskett T (2008) Recognition and language in low functioning autism. *J Autism Dev Disord* 38(7): 1259-1269.
31. Tager-Flusberg H, Paul R, Lord CE (2005) Language and communication in autism. In: Volkmar F, Paul R, Klin A, Cohen DJ, (Eds.), *Handbook of autism and pervasive developmental disorder* (3rd edn), New York.
32. National Research Council, Committee on Educational Interventions for Children with Autism (2001) *Educating Children with Autism*. National Academics Press.
33. Koegel LK, Bryan KM, Su PL, Vaidya M, Camarata S (2020) Definitions of nonverbal and minimally verbal in research for autism: A systematic review of the literature. *J Autism Dev Disord* 50(8): 2957-2972.
34. Kasari C, Brady N, Lord C, Tager-Flusberg H (2013) Assessing the minimally verbal school-aged child with autism spectrum disorder. *Autism Res* 6(6): 479-493.
35. McGrew JH, Ruble LA, Smith IM (2016) Autism spectrum disorder and evidence-based practice in psychology. *Clin Psychol Sci Practice* 23(3): 239-255.
36. Gelbar NW, Anderson C, McCarthy S, Buggie T (2012) Video self-modeling as an intervention strategy for individuals with autism spectrum disorders. *Psychology in the Schools* 49(1): 15-22.
37. Odom S, Thompson J, Hedges S, Boyd B, Dykstra J, et al. (2015) Technology-aided interventions and instruction for adolescents with autism spectrum disorder. *J Autism & Dev Disord* 45(12): 3805-3819.
38. Grynspan O, Weiss PL, Perez-Diaz F, Gal E (2014) Innovative technology-based interventions for autism spectrum disorders: A meta-analysis. *Autism* 18(4): 346-361.
39. McCleery JP (2015) Comment on technology-based intervention research for individuals on the autism spectrum. *J Autism Deve Disord* 45(12): 3832-3835.
40. Rayner C, Denholm C, Sigafoos J (2009) Video-based intervention for individuals with autism: Key questions that remain unanswered. *Res Autism Spectr Disord* 3(2): 291-303.
41. Ayres KM, Langone J (2005) Intervention and instruction with video for students with autism: A review of the literature. *Educ Train Develop Disabil* 40(2): 183-196.
42. Bellini S, Akullian J (2007) A meta-analysis of video modeling and video self-modeling interventions for children and adolescents with autism spectrum disorders. *Exceptional Child* 73(3): 264-287.
43. Buggie T (1995) Videotaped self-modeling: The next step in modeled instruction. *Early Educ Dev* 6: 39-51.
44. Buggie T (2007) A picture is worth. Video self-modeling applications at school and home. *J Positive Behav Intervent* 9(3): 151-158.
45. Delano ME (2007) Video modeling interventions for individuals with autism. *Remedial & Special Educ* 28(1): 33-42.
46. Dowrick P (1999) A review of self-modeling and related interventions. *Appl Preventative Psychol* 8(1): 23-39.
47. Hitchcock C, Dowrick P, Prater M (2003) Video self-modeling intervention in school-based settings: A review. *Remed Special Educ* 24(1): 36-45.
48. McCoy K, Hermansen E (2007) Video modeling for individuals with autism: A review of model types and effects. *Educ Treat Child* 30(4): 183-213.

49. Mechling L (2005) The effect of instructor-created video programs to teach students with disabilities: A literature review. *J Spec Educ Technol* 20(2): 25-36.
50. Sturmey P (2003) Video technology and persons with autism and other developmental disabilities: An emerging technology for PBS. *Journal of Positive Behavior Interventions* 5: 3-4.
51. Wissick CA (1996) Multimedia: Enhancing instruction for students with learning disabilities. *Journal of Learning Disabilities* 29: 494-503.
52. Haring TG, Kennedy CH, Adams MJ, Pitts-Conway V (1987) Teaching generalization of purchasing skills across community settings to autistic youth using videotape modeling. *J Appl Behav Anal* 20(1): 89-96.
53. Sigafoos J, O'Reilly M, de la Cruz B (2007) How to use video modeling and video prompting. Austin TX: Pro-Ed.
54. Schreibman L, Whalen C, Stahmer AC (2000) The use of video priming to reduce disruptive transition behavior in children with autism. *J Positive Behav Interventions* 2: 3-11.
55. Cannella-Malone H, Sigafoos J, O'Reilly M de la Cruz B, Chatur E, Giulio EL (2006) Comparing Video Prompting to Video Modeling for Teaching Daily Living Skills to Six Adults with Developmental Disabilities. *Educ Train Dev Disabil* 41(4): 344-356.
56. Payne E, Antonow J (1982) Development and applications of user produced interactive videotape instructional materials. *J Special Educ Technol* 5(4): 33-36.
57. Buggy T, Toombs K, Gardener P, Cervetti M (1999) Training responding behaviors in students with autism: Using videotaped self-modeling. *J Positive Behav Interventions* 1(4): 205-214.
58. Buggy T (2005) Video self-modeling applications with students with autism spectrum disorder in a small private school setting. *Focus Autism Other Develop Disabil* 20(1): 52-63.
59. Mechling L, Pridgen L, Cronin B (2005) Computer-based video instruction to teach students with intellectual disabilities to verbally respond to questions and make purchases in fast food restaurants. *Educ Train Dev Disabil* 40(1): 47-59.
60. Gallardo Montes C del P, Rodríguez Fuentes A, Caurcel Cara MJ (2021) Apps for people with autism: Assessment, classification and ranking of the best. *Technol Soc* 64: 101474.
61. Bittner M, Myers D, Silliman-French L, Nichols D (2018) Effectiveness of instructional strategies on the motor performance of children with autism spectrum disorder. *Palaestra* 32(2): 36-42.
62. Whittington-Barnish AK (2012) Research to practice: Evaluation of conversation skills video modeling intervention for adolescents with autism. In ProQuest LLC.
63. Radley KC, Helbig KA, Schrieber SR, Ware ME, Dart EH (2021) Superheroes social skills: A comparison of video only and full curriculum on social skill use. *Focus Autism Other Dev Disabil* 36(2): 95-107.
64. Gilmour MF (2015) Comparing the teaching efficacy of two video modeling programs delivered in a group format in special education classrooms to improve expressive language. *J Spcl Educ Technol* 30(2): 112-121.
65. Collet-Klingenberg L (2015) Determination of GemIni© systems as a proven and effective treatment for individuals with autism spectrum disorder and/or other developmental disabilities. Wisconsin Department of Health Services, Treatment Interventional Advisory Committee.
66. GemIni© Support (2021) Pricing and Financial Aid Options.
67. Tager-Flusberg H (2014) Promoting communicative speech in minimally verbal children with autism spectrum disorder, editorial. *J Am Acad Child Adolesc Psychiatr* 31(1): 612-613.
68. Ur P (1996) A course in language teaching: Practice and theory. Cambridge University Press.
69. Zhang Y (2009) Reading to speak: Integrating oral communication skills. *English Teaching Forum* 47(1).
70. Bellanca JA, Fogarty RJ, Pete BM (2012) How to teach thinking skills within the common core. Bloomington, IN: Solution Tree Press.
71. Johnston JM, Pennypacker HS, Green G (2020) Strategies and tactics of behavioral research and practice (4th Edn.). Routledge Publishing Group.
72. Kazdin AE (2011) Single-case research designs: Methods for clinical and applied settings (2nd Edn.). Oxford University Press.
73. Shukla-Mehta S, Miller T, Callahan KJ (2010) Evaluating the effectiveness of video instruction on social and communication skills training for children with autism spectrum disorders: A review of the literature. *Focus Autism Dev Disabil* 25(1): 23-36.
74. MacDonald RPF, Dickson CA, Martineau M, Ahearn WH (2015) Prerequisite skills that support learning through video modeling. *Educ Treat Child* 38(1): 33-47.
75. Morlock L, Reynolds JL, Fisher S, Comer RJ (2015) Video modeling and word identification in adolescents with autism spectrum disorder. *Child Language Teach Therap* 31(1): 101-111.
76. Heward WL, Alber-Morgan SR, Konrad M (2022) Exceptional children: An introduction to special education (12th Edn.): Pearson.
77. Pickett E, Pullara O, O'Grady J, Gordon B (2009) Speech acquisition in older nonverbal individuals with autism: A review of features, methods, and prognosis. *Cogn Behav Neurol* 22(1): 1-21.
78. Kasari C, Kaiser A, Goods K, Nietfeld J, Mathy P, et al. (2014) Communication interventions for minimally verbal children with autism: A sequential multiple assignment randomized trial. *J Am Acad Child & Adolesc Psychiatr* 53(6): 635-646.
79. Shire S, Goods K, Shih W, Distefano C, Kaiser A, et al. (2015) Parents' adoption of social communication intervention strategies: Families including children with autism spectrum disorder who are minimally verbal. *J Autism Devel Disord* 45(6): 1712-1724.
80. Bal VH, Katz T, Bishop SL, Krasileva K (2016) Understanding definitions of minimally verbal across instruments: evidence for subgroups within minimally verbal children and adolescents with autism spectrum disorder. *J Child Psychol & Psychiatry* 57(12): 1424-1433.



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